Personality and Psychological Stress

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IN THIS PAPER are included three rather diverse themes which have a common origin in a research program on psychological stress which is still in progress While the questions originally posed in this program cannot as yet be completely answered, there are certain observations which the authors believe merit mention These observations are in the nature of "by-products," i e , they represent problems upon which the research was not primarily intended to focus

The general aim of the research program has been to investigate personality-based individual differences in response to stressor conditions[3] Our theoretical position, elaborated elsewhere (4), has led us to focus upon two kinds of personality characteristics, motivational and regulative As one means of measurement of motive, we selected the fantasy index of the need for achievement developed by McClelland and his colleagues (7) Our work with this index provides the basis for the first of the three themes of this paper, i e , that the relationship between the expression of a need in fantasy and its actualization in behavior need not necessarily be a direct and positive one

In the course of our experimentation, and in the preliminary analysis of data, it became quite clear to us that there was hazard in looking for simple, uncomplicated effects of our independent vari-

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[3] By stressor conditions, a term which the reader will encounter frequently in this report, we mean those experimental conditions which are designed by an experimenter to be stressful, but which are not necessarily responded to or perceived as such by the subject We reserve the term stress to refer to a state of the organism rather than the circumstances to which the individual is exposed

ables This constitutes the second theme of this paper, namely, that the influence of any variable in the determination of behavior will depend upon the context of other variables in which it occurs In terms of our theoretical framework, we have found such interactive effects among the three kinds of independent variables which we have investigated—motivation, regulation, and characteristics of experimental conditions

The third theme which we would discuss is made possible by the fact that we happened to use subject populations in our experiments which differed in educational and age levels We were able to trace changes in certain dependent variables over the various levels, thus allowing a developmental interpretation of our results That is, we were able to assess the effect of a stressor condition on individuals of different developmental levels in terms of a developmental "yardstick." This points to an approach to the experimental study of stress which holds considerable promise

The remainder of this paper consists of an elaboration of these three themes The experimental methodology, which is common to all three, will be described as the development of the themes requires it

FANTASY INDICES OF MOTIVATION IN THE PREDICTION OF BEHAVIOR

We have maintained elsewhere (4) that psychological stress involves the thwarting of a motive state and we have proposed that whether a stress state will, in fact, occur depends in part upon motivational characteristics of the individual Accordingly, in the design of our experiments, the measurement of motivation was an important methodological problem

As one means of measurement, we chose the *n* Achievement score as derived from imaginational productions We had two reasons for this First, considerable research has been done with this measure by McClelland and his co-workers (7) Second, it is our contention that for stress to occur there must be a certain relevance between a motive state and the thwarting circumstances to which an individual is exposed Since we were using failure-information and time-pressure (with its implication of failure) as the two principal means of inducing stress, we thought that the need to achieve would be a particularly appropriate motive with which to work

Our initial plans called for using the imaginational or fantasy index to distinguish high and low achievement-motivated persons whose behavior could be investigated under different sorts of conditions, including stressors However, the data from such studies as we have performed throw some doubt upon the validity of two premises underlying the use of a fantasy index of motivation, i e , (*a*) that need states are necessarily expressed in fantasy, and (*b*) that when they are there is necessarily a direct and positive relationship between the amount of need-related imagery and the degree of actualization of the need in behavior

Several of our experiments are relevant to the problem under discussion inasmuch as each included administration of two stimulus pictures, story productions to which were scored for *n* Achievement and related to performance on an experimental task The two pictures employed were Card 7BM of the TAT and Card B of the McClelland series (7) The task given to the *S*s was to listen to and reproduce, one at a time, a series of tape-recorded paragraphs, each about 50 words in length The *S*s were instructed in the use of the tape-recorder and were told that they could handle it in any way that they wished in order to transcribe the paragraphs They could stop the machine any time, they could reverse it at will in order to replay the material, etc , the only restriction being that they could not write while the recorder was playing Instructions as to how the *S*s should handle the paragraph material and what they should write down were also left undefined In short, the subjects were left to interpret and handle the task in their own way The reasoning behind this procedure was that vague instructions would encourage the expression of the individual's stylistic characteristics, an aspect of personality functioning typically slighted by tasks which aim to measure only speed and/or accuracy of performance

The *S*s performed the task under several experimental conditions, including one identified for the *S* as "practice," ostensibly providing an opportunity to become familiar with the task, and a second identified as the trial which counted as the "test," where *S*s were exhorted to do the very best that they could, since their effectiveness was to be measured for comparison with others There were two different paragraphs to be transcribed in each condition Not only were all four paragraphs of virtually the same length in terms of number of words, but an attempt was made to control for type of content and level of difficulty from one condition to the other.

In the analysis of the data obtained from the recorder-task, one measure employed indicated the degree of literalness in the *S*'s performance, i e , the extent to which his transcription was verbatim On the basis of the motivational interpretation of the *n* Achievement score one might predict a positive relationship between it and the degree of literalness of performance because a verbatim, literal performance might, at first glance, be construed as the epitome of achievement on the task Such a prediction, in fact, seems to be borne out in our studies In Table 1, where the dependent variable is the average number of words reproduced for two 50-word paragraphs, with penalties for the introduction of words not present in the original paragraphs, high scores represent "accurate," literal transcriptions The observed pattern, i e , for high *n* Achievement to be associated with greater literalness, was found in several different subject populations in different experiments, though not reaching statistical significance in all cases

TABLE 1*

DEGREE OF LITERALNESS OF PARAGRAPH REPRODUCTION AS A FUNCTION OF *n* ACHIEVMENT AND EXPERIMENTAL CONDITIONS

	"Practice"	"Test"
High *n* Achievement ($N=13$)	36 17	39 48
Low *n* Achievement ($N=13$)	18 94	30 26

*Analysis of variance of the interaction yields an *F* of 14 66 with significance below the 01 level Only the difference between the *n* Achievement groups under the practice condition is significant ($p=.05$) *S*s were college juniors and seniors, ranging in age from 19 to 23

Further examination of the data, however, necessitated a reinterpretation of this finding We found that many of the *S*s showing lesser degrees of literalness had in fact seemed to eschew a verbatim approach to the task in favor of a more conceptual—and no less effective or effortful—approach. We called this method of handling the task conceptual, and effective, because these *S*s successfully captured the essential points of each paragraph through paraphrasing, sometimes omitting much of the verbal chaff which did not contribute to the meaning of the paragraph Because it seemed that they had come to closer grips with the ideas involved in the paragraphs than had the verbatim transcribers, we did not think it likely that there was any lesser expenditure of "mental effort" In a very real sense there was no sacrifice of "accuracy," since in no instance was the tendency to paraphrase associated with the loss of essential ideational content Thus it would not seem appropriate to conclude that these *S*s, though having low *n* Achievement scores, were any less achievement-oriented in their behavior than those who had made verbatim transcriptions and had high *n* Achievement scores

If the *n* Achievement score is not an *uncomplicated* index of achievement-oriented behavior, then, what is its nature, and what implications would such a reinterpretation have for the relationship between motivation, fantasy, and behavior? At this point in the development of our argument we would offer two thoughts First, since persons who exerted considerable "mental effort" on the task and who performed quite "effectively" expressed the least amount of achievement-related imagery, we would say that motives which may be presumed to exist in the organism need not necessarily be reflected in fantasy Other support for this conclusion may be seen in the work of Clark (1), who found that arousal of the sexual need resulted in a *reduction* of sex-related imagery in fantasy productions To account for this, Clark invoked the explanation that the sexual arousal produced anxiety and guilt and led to the inhibition of its expression in fantasy We will also suggest later that whether a need will be expressed in fantasy or not will depend upon regulative characteristics of personality

Second, it is indicated that degree of literalness should not be interpreted as a measure of *effectiveness* of performance inasmuch as the "conceptual" and "literal" types of performance can be regarded from different points of view as equally effective We believe that these two types of performance should be considered as reflecting preferred styles or approaches characteristic of the individual[4]

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[4] A recent article by Gomulicki (**2**) reviews a long history of attempts to identify stylistic characteristics of persons in the way they reproduce verbal material, usually in recall Our dichotomous classification of literal-conceptual seems very close to categories described by earlier investigators, but attempts to empirically link these latter categories to any well-defined personality variables have been lacking

According to this line of reasoning, high and low *n* Achievement scores would be associated with different modes of coping with one's world Fortunately, there is another finding from our research which affords clarification of this unexpected relationship and which yields additional information pertinent to the interpretation of the *n* Achievement score

Some of our experiments involved three groups of male *S*s from different education levels—advanced high school students, college lower-classmen (freshmen and sophomores), and college upperclassmen (juniors and seniors) We found significant differences in amount of achievement imagery among these three groups, the high school group showing the *highest* incidence and the advanced college group the *lowest* (see Table 2) Since it is unlikely that advanced college students are less motivated to achieve than high school students, the direct and positive relationship traditionally posited between the *n* Achievement score and achievement-oriented behavior would seem to require re-examination[5]

TABLE 2

n ACHIEVEMENT SCORES* AS A FUNCTION OF EXPERIMENTAL POPULATION

	Mean *n* achievement score†
High School ($N=40$)	5 30
College Lowerclassmen ($N=30$)	3 56
College Upperclassmen ($N=39$)	2 41

*Scores are based on McClelland's scoring system using two TAT cards

†All differences between groups, based upon *t* tests, are statistically significant at less than the 05 or 01 levels

The high school *S*s ranged in age from 16 to 18, the college lowerclassmen (freshmen and sophomores) from 18 to 20, and the college upperclassmen (juniors and seniors) from 19 to 23

The fact that these subject groups represent three different educational and age levels suggests a further reinterpretation of the *n* Achievement measure That is, whether a need is expressed in fantasy or is actualized in behavior may be a function of the relative level of maturity of the individual, the fantasy expression being characteristic of the less mature person We would go a step further and suggest that that which distinguishes between individuals of greater and lesser maturity is the relatively greater development in the former of ego-control or regulative processes which interact with, and modify the expression of, motive states, leading to the discharge of motivation along more appropriate avenues than fantasy

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[5] Still another type of evidence relevant to the relation between *n* Achievement and achievement-oriented behavior has very recently been analyzed from a later study in our research program. Vogel, using the McKinney Reporting Test as the experimental task, found that the *n* Achievement score is inversely related to amount and accuracy of output. That is, persons with lesser expression of achievement-related imagery show superior accomplishment on the experimental task

In keeping with the first-mentioned finding—that high and low *n* Achievement are associated, respectively, with the "literal" and "conceptual" approaches to the tape-recorder task—we would now suggest that these two approaches represent functioning at different levels of development That this is the case is confirmed by a comparison of our three groups from different educational and age levels, showing that the "literal" approach is more characteristic of the less advanced students, the "conceptual" approach more characteristic of the more advanced students (see Table 3) Thus the *n* Achievement score seems to be associated with a style or mode of approach which is developmentally defined

TABLE 3

Degree of Literalness of Paragraph Reproduction*
as a Function of Experimental Populations

	Index of literalness†
High School (*N*=40)	1 15
College Lowerclassmen (*N*=30)	1 24
College Upperclassmen (*N*=39)	1 63

*Index of literalness is obtained by dividing the number of words written by each *S* by the number of words which appear in the original recorded passage Thus, a perfectly verbatim transcription would yield a ratio of 1 and the more the subject paraphrases the content of the passage, the higher will be the ratio

†All differences between groups, based on *t* tests, are statistically significant at less than the 05 level

The high school *Ss* ranged in age from 16 to 18, the college lowerclassmen (freshmen and sophomores) from 18 to 20, and the college upperclassmen (juniors and seniors) from 19 to 23

On the basis of tables 2 and 3 alone, it might be asserted that the relationship between *n* Achievement and performance style is spurious and that the two variables are related only because *n* Achievement is related to educational level in our samples However, the data in Table 1 show that *n* Achievement is related to literalness of performance within an educationally homogeneous sample

We believe that the expression of needs in fantasy, and the relationship between the fantasy and the behavioral expression of needs, are dependent upon the interaction of motivational *and* regulative characteristics of the individual That is, the influence which a need has in the determination of behavior is a function of the context of controlling or regulative processes in which it occurs.

It is our position that the *n* Achievement measure reflects the interaction of these two kinds of personality characteristics and is not, as might be proposed, a "pure" measure of motive state We would contend, furthermore, that the *n* Achievement score is also an index of the individual's style or method of coping with his world More particularly, this style is developmentally defined, a high *n* Achievement score being associated with a kind of functioning characteristic of a lower level of maturity

THE INTERACTION OF MOTIVATION, COGNITIVE CONTROLS, AND EXPERIMENTAL CONDITIONS

It may be noted from Table 1, presented earlier, that high and low *n* Achievement *S*s tend to show different degrees of literalness in their paragraph reproductions under different experimental conditions Under the "practice" condition high *n* Achievement *S*s were more literal than *S*s low in *n* Achievement, but under a condition where *S*s were exhorted to "do their best" as they were to be compared with others, this difference was less marked This finding, and several others like it, exemplify the importance of analysis of interactions

In the previous section we pointed out that motivational and regulative characteristics of individuals must be considered to interact in the determination of behavior, the influence of one depending upon the nature of the other In this portion of the paper we would introduce another broad class of variables which may be expected to exist in interactive relationship with characteristics of individuals, i e , characteristics of the situations to which individuals are exposed We will present findings in this section of the paper which support the interactional hypothesis and which underscore the limitations of the traditional experimental approach to the problem of stress, which has consisted largely of a search for main effects of experimental conditions

For our purposes here, we take motive states as our point of departure, investigating their effects on behavior as a function of experimental conditions and cognitive controls We are less concerned here with a systematic consideration of the entire range of experimental results of the research program than with the elaboration of two sets of particularly relevant data which are regarded as illustrative of certain theoretical and methodological principles

In one of our subject samples, motivation was manipulated by use of monetary incentive The subjects were randomly assigned to two incentive groups One, the high incentive group, was told that they could win as much as ten dollars during the experiment, depending upon the nature of their performance on the paragraph transcription The low incentive group was informed that they could win up to ten cents The experimental task, described in the first section, was performed under the "practice" and "test" conditions and "time pressure," which involved a marked reduction of time available to the *S*s for completion of the task Even though no incentives were given during the practice condition, the *S*'s were aware that rewards of a particular amount would be offered in subsequent conditions Thus, the *S*s were probably differently motivated during practice

Upon completion of the "practice" condition the incentive money for both groups was placed on the table in full view of *S*, the one group seeing ten dollars in dollar bills and fifty-cent pieces, the other seeing only ten pennies After each of the two paragraphs[6] of the "test" condition and the first paragraph of the "time pressure" condition, the experimenter appeared to scrutinize carefully *S*'s protocol and to consult a "table of norms" in order to determine the amount of prize money which the subject had earned Actually, the amount of reward was preordained Each high incentive *S* received a fifty-cent piece after the first paragraph of the "test" condition, a dollar bill after the second, and another fifty-cent piece after the first paragraph of the "time-pressure" condition By contrast, the low incentive *S*s received rewards of one cent, two cents, and one cent respectively While the absolute amount of reward thus differed for the two groups, the information which each group received about the

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[6] As in all the experiments employing the paragraph reproduction task, two different paragraphs were used in each condition, and an attempt was made to control for length of paragraphs, type of content, and level of complexity across the several conditions

"quality" of its performance was roughly equivalent in terms of relative success and failure.

Following the recorder task all *S*s were administered the color-word test This test was used—largely on the basis of work done by Klein (3)—as a means of identifying different cognitive controls or styles It presents three tasks to the *S* (*a*) to read aloud as quickly as possible three color names (red, green, and blue) which are printed on a white card in black ink a total of 100 times; (*b*) to identify successively as quickly as possible by color name 100 colored rectangles of the same three hues and in the same sequence as in (*a*), (*c*) to name as quickly as possible the color of the ink in which 100 color names are printed, where the color name and the ink hue are incongruent Performance on part (*c*) requires that the subject disregard a strong tendency to read the color names and instead name the color of the ink This is interpreted as reflecting an *S*'s ability to maintain a set in the face of strong and persistent, but 'irrelevant," stimulation It thus seems to be a measure of an ability to regulate competing responses, to resist the effects of interfering response tendencies Accordingly, it has been referred to as a measure of "interference proneness" (3) Rather large individual differences exist in this capacity, as indicated by the broad range of times required to complete part (*c*) in relation to the rate on part (*b*), and we attribute this variation to differences in regulative or cognitive control characteristics in the personality

The first finding which we would discuss in this section concerns an interaction between incentive conditions (representing different degrees of motivation) and experimental conditions (practice, test, and time pressure), where the dependent variable is—as it was in the first section—degree of literalness of performance Table 4 embodies this finding While there are not significant main effects of incentives or experimental conditions, using analysis of variance, there is a significant interaction (below the 05 level of confidence) between the two sources of variation A tendency is found for the more motivated *S*s to be less literal (more conceptual) in approach than the low motivated group under the practice condition, this difference disappearing under the "test" condition, only to reappear in a more accentuated form in the time pressure condition Of course, the repeated measurements design confounds time and amount of practice, making the interpretation of the effects of the experimental conditions less precise

TABLE 4

DEGREE OF LITERALNESS* OF PARAGRAPH REPRODUCTION AS A FUNCTION OF MOTIVE STATE AND EXPERIMENTAL CONDITIONS†

	"Practice"	"Test"	"Time pressure"
Strong Motivation ($N=14$)	1 18	1 06	1 25
Weak Motivation ($N=14$)	1 11	1 08	1 05

*Index of literalness is obtained by dividing the number of words written by each *S* by the number of words he wrote which appear in the original recorded passage Thus, a perfectly verbatim transcription would yield a ratio of 1 00 and the more the subject paraphrases the content of the passage, the higher will be the ratio

†Analysis of variance yields an interaction F of 3 22 which is significant at less than the 05 level There were no main effects, and none of the t tests produced significant differences

*S*s were high school students ranging in age from 16 to 18

In keeping with the interactional hypothesis, then, the effects of motivation are seen to depend upon the nature of the circumstances to which the individual is exposed More pertinent to our interest in the problem of behavior under stressor conditions, we may conclude from this finding that the effects which stressor circumstances will have on an individual will depend upon the motivational state of that individual It seems, furthermore, that the stressor condition has the effect of making more pronounced the difference in performance of differentially motivated *S*s which is less apparent in a more benign condition, i e , practice That is, stressor conditions serve to make high motivated *S*s less literal and low motivated *S*s more literal If we accepted the use of literalness as an index of effectiveness of performance, and argued that greater literalness represents lesser effectiveness (being associated with a lower level of maturity, see Table 3), the stressor condition acts to improve the performance of the high motivated *S*s and to impair the performance of the low motivated *S*s

Another finding from our research which may be used to illustrate the interactional hypothesis involves analysis of the manner in which *S*s manipulate the recorder For example, *S*s may be observed to differ in the frequency with which they reverse the recorder in the course of transcription in order to play material back We had anticipated that the more motivated *S*s would reverse the machine more often than less motivated *S*s, and while this is in part the case, it is not the whole story Here again the effect of motivation depends upon other factors, this time the cognitive control characteristics of the individual These cognitive control characteristics, indicated in Table 5 as "high interference" and "low interference," are inferred from performance on the color-word test, previously described High interference *S*s are those who experience relatively greater difficulty in naming the color of the ink in which color names are incongruously printed, rather than reading the color names

TABLE 5

FREQUENCY OF MACHINE REVERSES PER PARAGRAPH AS A FUNCTION OF MOTIVE STATE AND INTERFERENCE PRONENESS*

	High interference	Low interference
Strong Motivation	1 17 ($N=6$)	33 ($N=13$)
Weak Motivation	62 ($N=7$)	53 ($N=13$)

*Analysis of variance yields an interaction *F* of 6 90 which is significant at less than the 05 level There was also a significant main effect of interference-proneness All comparisons by *t* tests other than those under weak motivation were significant at well below the 05 level, except the difference between high and low interference groups under the weak motivation condition

*S*s were high school students ranging in age from 16 to 18

Table 5 shows frequency of reverses as a function of motivational state (induced through use of differential incentives) and cognitive control (degree of susceptibility to interference on the color-word test) While motivation by itself does not produce a main effect, it does have an influence on frequency of reverses when degree of interference proneness of the individual is taken into account (interaction significant at 05 level of confidence) Degree of interference proneness does not result in differences in frequency of reverses under the weak motivation condition, but it does under strong motivation For high interference-prone *S*s strong motivation produces a marked increase in frequency of reverses, for low interference-prone *S*s strong motivation tends to produce fewer reverses It may be that high interference-prone individuals are less able to modulate their behavior and impulse expression when strong motive states are aroused

With respect to frequency of reverses, there were also significant effects of the experimental conditions which are not presented here in detail For example, the frequency of reverses declines from the practice condition to the test condition, and still further, as would be predicted, under time pressure The subject apparently cannot afford the luxury of reversing and checking when he is under an actual test condition, and even less when he is severely restricted as to time Moreove he nature of this decline varies with the factor of interference-proneness, being much sharper for the high interference group which makes more reverses under the practice and test conditions than the low interference group These findings, however, are far less provocative than the interaction between motivation and cognitive control

By way of brief summary, in this section we have shown that the effect which a motive state will have on behavior will depend upon (*a*) situational variables, inasmuch as in different experimental conditions motive state had different consequences for behavior, and (*b*) other personality characteristics of the individual (i e, cognitive control processes), inasmuch as in *S*s with different cognitive control processes, motive state had different—indeed opposite—consequences in behavior

Another illustration of this type of finding is found in the work of Klein (3), who determined that the tendency of *S*s to overestimate or underestimate the size of discs bearing thirst-related symbols was not a function of degree of thirst, but of the *S*'s cognitive style The motive state, thirst, did serve to accentuate the effect of the pre-existing style, but if two kinds of *S*s had not been identified in terms of cognitive style no effect of thirst would have been found Klein would have been forced to the erroneous conclusion that need had no consequence for behavior

PROGRESSION AND REGRESSION UNDER STRESS AS A FUNCTION OF LEVEL OF COGNITIVE DEVELOPMENT

In this section it will become clear that our conceptualization of the problem of stress has been influenced by developmental psychology Elsewhere (4) we have pointed out how, in addition to several kinds of independent variables defined in other than genetic terms, it may be of value in understanding behavior under stress to systematically investigate individuals who differ along developmental dimensions

Work with this kind of variable should increase our understanding of individual differences in response to stressor conditions, as individuals varying in level of maturity should be expected to show differential reaction Some work along these lines has already been reported by Lofchie (6)

We would point out here that there is yet another important way in which the developmental orientation can contribute to research in stress, and that is in terms of a more meaningful analysis of what happens to behavior under conditions of stress Whereas the approach alluded to in the above paragraph and the results of the first section involve the application of developmental principles to the organization of independent variables, here such principles would be applied to the analysis of dependent variables The traditional approach to the investigation of behavior under stressor conditions has sought simple improvement or impairment of performance, a strictly achievement analysis, usually in terms of speed and/or accuracy Developmental theory, on the other hand, offers a means of getting "beneath" such superficial aspects of behavior to the level of process, or genotype In addition to this, it offers a means of gauging movement or change in behavior from one condition to another in terms of progression or regression A principal task for the investigator who would use this approach is the discovery or invention of experimental tasks which lend themselves to developmental analysis

The experiments reported in this paper were not influenced at their inception by the developmental framework, but there are two factors which—more or less fortuitously—make possible a *post hoc* developmental analysis of the effects of stressors First, one of the measures taken from the color-word test, assumed to reflect a cognitive control characteristic, is known by independent research to have developmental significance That is, in studies involving different age groups of children (5) the measure has been shown to undergo systematic changes with increasing age Accordingly, the measure may be used to differentiate less mature from more mature *S*s and the reaction of these two kinds of *S*s to stressor conditions may be studied Second, as was mentioned earlier, the fact that we employed *S*s of varying age and educational levels permitted us to examine our dependent variables for developmental changes from the less mature to more mature groups One performance variable—degree of literalness—was found to have developmental significance and thus provides a "scale" along which progression and regression under stressors may be measured

The cognitive control measure employed here as an independent variable is derived from the first two cards of the color-word test, which may be referred to as Cards A and B It will be recalled that Card A, color-name reading, requires the *S* to read aloud serially, and as quickly as possible, three color names (red, green, and blue) which are printed a total of 100 times in black ink on a white cardboard backing Card B, color-naming, requires an *S* to serially identify by name as quickly as possible 100 rectangular slabs colored in the same three hues and in the same sequence as in Card A It has long been known that color-naming virtually always, in the literate adult, takes longer than color-name reading Some investigators have maintained, with experimental evidence to offer in support (8), that this differential is due to the greater amount of practice which one has had in the course of his development in associating verbal responses to written words rather than to colors Accepting this argument, and being mindful of the wide individual differences in the measure involved, we presumed that a comparison of the scores on cards A and B would yield an indication of the extent to which an individual has developed facility in the use of verbal symbols *S*s with a large difference between the two time scores we refer to as "verbal" individuals, those with a small difference as "non-verbal" Specifically, those *S*s whose ratio of naming colors to reading color names is 1 40 or greater are considered verbal, those with a lesser ratio non-verbal Degree of "verbalness" we regard as a stylistic or cognitive control characteristic of persons, a mode of functioning which is characteristic of the individual

It has also been determined in studies with children (5) that while the rates for the two tasks (cards A and B) progressively increase with age, the speed of reading color names increase relatively faster than the speed of naming colors Unpublished research has confirmed the finding with children and, moreover, has indicated that degree of "verbalness" tends to distinguish psychology graduate students from undergraduate university students It appeared to us, accordingly, that the verbal-non-verbal dimension provided an index of cognitive development which could be used in investigating sources of individual differences in response to stressor conditions based upon differences in level of maturity

The dependent variable employed here, the "literal-conceptual" dimension of paragraph reproduction already described in an earlier section, has also been found to have developmental significance. Our studies have employed *S*s from three different age and educational levels (high school students, college lower-classmen, and college upperclassmen) and have shown that the literal approach is more characteristic of the less mature *S*s, the more mature *S*s being more "conceptual" (see Table 3). Related as it is to level of maturity, degree of literalness as a dependent variable thus offers a means of gauging, in developmental "units," the influence of cognitive control characteristics and experimental conditions.[7]

We expected that "verbal" *S*s, in comparison with "non-verbal" ones, would be more "conceptual" in their mode of approach to paragraph reproduction for two reasons. First, being of higher developmental level, they should function at a higher developmental level on the task. Second, having had greater practice in the use of verbal symbols, they should find the "abstract" approach more congenial.[8] This expectation was confirmed, as indicated in Table 6.

The effects of the stressor condition, also shown in Table 6, make good sense in the developmental framework. That is, the

TABLE 6

DEGREE OF LITERALNESS OF PARAGRAPH REPRODUCTIONS* AS A FUNCTION OF VERBALNESS AND EXPERIMENTAL CONDITIONS†

	"Practice"	"Test"	"Time pressure"
Verbal ($N=11$)	1.22	1.11	1.35
Non-Verbal ($N=16$)	1.06	1.03	1.00

*Index of literalness is obtained by dividing the number of words written by each *S* by the number of words which appear in the original recorded passage. Thus, a perfectly verbatim transcription would yield a ratio of 1 and the more the subject paraphrases the content of the passage, the higher will be the ratio.

†Analysis of variance yields an interaction *F* of 3.62 which is significant at less than the .05 level. There were no main effects. The difference between verbal and non-verbal groups under time pressure approached significance. The *t* was 2.01 and the *t* needed for significance at the .05 level is 2.06.

*S*s were high school students ranging in age from 16 to 18.

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[7] The experimental conditions employed have already been described in the first two sections. The type of stressor used was time pressure.

[8] Aside from the empirical development significance of degree of "verbalness," the tendency to be more practiced on verbal symbols seemed to us to have one further relevant implication, i.e., that greater commerce with verbal symbols would be associated with a greater ability or capacity for conceptual thinking. In support of this interpretation we found that "verbal" *S*s had better college grades than "non-verbal" *S*s, with intelligence controlled. In other experiments in our project they evinced greater interest in conceptual than in perceptual-motor activities, and were more effective than "non-verbal" *S*s in performing conceptual tasks (arithmetic) under a distraction stressor.

"verbal," more mature *S*s become even more "conceptual" under the stressor than they were under the "test" condition They seemed to have "moved up" the genetic scale, in achievement terms "improving" their performance On the other hand, the "non-verbal," less mature *S*s become even more "literal" than they were under the "test" condition (in fact, as literal as they possibly can) They have regressed in level of functioning

These data also confirm our finding, elaborated in the second section of this paper, that condition and personality variables interact in the determination of behavior Again it may be pointed out that important results may be obscured if only main effects of conditions are sought, and if personality differences among *S*s are not taken into account In this case, the effect of a stressor condition on different individuals may be opposite in direction, depending upon cognitive control characteristics of the *S*s

In summary, in this section we have shown that people who differ in a cognitive control characteristic having developmental significance respond differently to a stressor condition We believe that this indicates the potential fruitfulness of developmental parameters in investigating individual differences in response to a stressor Moreover, we have shown that the developmental analysis of appropriate experimental tasks offers a meaningful way of measuring the effects of stressors, in effect providing a developmental "yardstick" in terms of which progression and regression of function may be assessed We would underscore our provision for measuring progression, as we feel that traditional stress studies have neglected this possible consequence in favor of impairment of performance.

GENERAL SUMMARY

In this paper we have presented three somewhat rather diverse themes based upon several studies which are part of a larger research program investigating individual differences in response to stressor conditions.

The occasion for the first theme was our concern with the measurement of motivation, which we feel is an important source of such individual differences Our work with the *n* Achievement score, devised by McClelland (7) as a fantasy measure of motive state, led us to question two premises often considered to underlie that score (*a*) that motive states are *necessarily* reflected in fantasy, and (*b*) that there is *always* a direct and positive relationship between the expression of a need in fantasy and its actualization in behavior We suggest that a re-examination of the *n* Achievement score, and more particularly of the conditions under which it relates to achievement-oriented behavior, is indicated We maintain, furthermore, that whether a need will be expressed in fantasy, in behavior, or not at all is a function of regulative processes in the personality

The second theme, related to this last-made point, is that the traditional search for main effects of independent variables in stress experimentation must give way to analysis of interactions among variables, if such experimentation is to be most meaningful and realistic We demonstrated that the influence of a given variable in the determination of behavior is a function of the context of other variables in which it occurs. Two classes of potentially interacting variables were discussed, i e , attributes of the individual (motivational and regulative) and characteristics of the situation to which the individual is exposed

The third, and last, theme emphasizes the contribution which developmental psychology can make to the understanding of response to stressor conditions On the one hand, differences in the developmental level of individual—including individuals of equivalent chronological age—should be a significant factor in determining such response. In addition, the use of tasks which may be developmentally analyzed should provide meaningful dimensions for evaluating stress responses, e g , in terms of regression and progression of function

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